

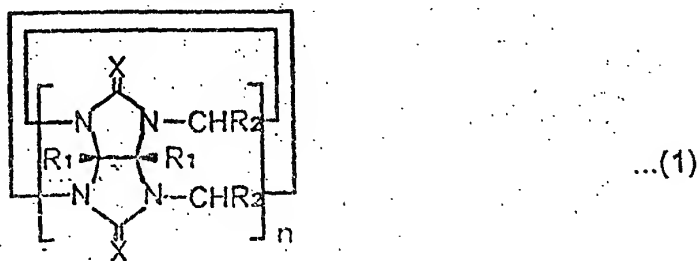
*SPECIFICATION AMENDMENTS*

Please insert the following as the first sentence:

This is a divisional of co-pending application No. 10/092,468, filed March 8, 2002, which is a divisional of application No. 09/605,635, filed June 28, 2000, now U.S. Patent No. 6,365,734, the disclosures of which are incorporated by reference.

Amendments to the paragraph beginning at page 2, line 18:

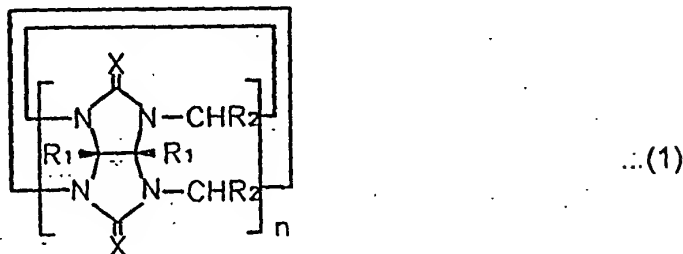
The first objective of the present invention is achieved by cucurbituril derivatives having the formula (1)



where X is O, S or NH;  $R_1$  and  $R_2$  are independently selected from the group consisting of hydrogen, alkyl groups of 1 to 30 carbon atoms, alkenyl groups of ~~1-2~~ to 30 carbon atoms, alkynyl groups of ~~1-2~~ to 30 carbon atoms, alkylthio groups of 1 to 30 carbon atoms, alkylcarboxyl groups of ~~1-2~~ to 30 carbon atoms, hydroxyalkyl groups of 1 to 30 carbon atoms, alkylsilyl groups of 1 to 30 carbon atoms, alkoxy groups of 1 to 30 carbon atoms, haloalkyl groups of 1 to 30 carbon atoms, nitro group, alkylamine groups of 1 to 30 carbon atoms, amine group, aminoalkyl groups of 1 to 30 carbon atoms, unsubstituted cycloalkyl groups of ~~5-5~~ to 30 carbon atoms, cycloalkyl groups of ~~4-4~~ to 30 carbon atoms with hetero atoms, unsubstituted aryl groups of 6 to 30 carbon atoms, and aryl groups of 6 to 30 carbon atoms with hetero atoms; and  $n$  is an integer from 4 to 20, wherein the cucurbituril derivatives having the formula (1), where  $n=6$ ,  $R_1=H$ ,  $R_2=H$  and  $X=O$ , and  $n=5$ ,  $R_1=CH_3$ ,  $R_2=H$  and  $X=O$ , are excluded.

Amendments to the paragraph beginning at page 3, line 8:

The second objective of the present invention is achieved by new preparation methods for cucurbituril derivatives having the formula (1)



where X is O, S or NH; R<sub>1</sub> and R<sub>2</sub> are independently selected from the group consisting of hydrogen, alkyl groups of 1 to 30 carbon atoms, alkenyl groups of ~~1~~2 to 30 carbon atoms, alkynyl groups of ~~1~~2 to 30 carbon atoms, alkylthio groups of 1 to 30 carbon atoms, alkylcarboxyl groups of ~~1~~2 to 30 carbon atoms, hydroxyalkyl groups of 1 to 30 carbon atoms, alkylsilyl groups of 1 to 30 carbon atoms, alkoxy groups of 1 to 30 carbon atoms, haloalkyl groups of 1 to 30 carbon atoms, nitro group, alkylamine groups of 1 to 30 carbon atoms, amine group, aminoalkyl groups of 1 to 30 carbon atoms, unsubstituted cycloalkyl groups of ~~5~~5 to 30 carbon atoms, cycloalkyl groups of 4 to 30 carbon atoms with hetero atoms, unsubstituted aryl groups of 6 to 30 carbon atoms, and aryl groups of 6 to 30 carbon atoms with hetero atoms; and n is an integer from 4 to 20.

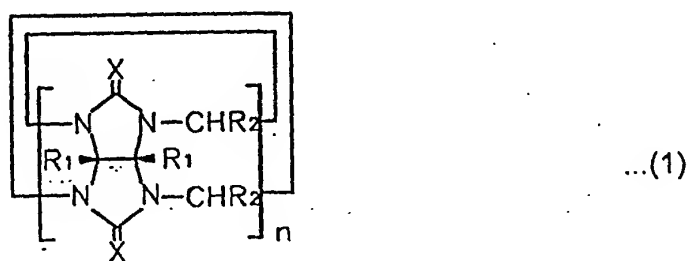
Amendment to the paragraph beginning at page 4, line 24:

Each of the above three methods for preparing cucurbituril derivatives having the formula (1) hereinabove, may further comprise: (c1) crystallizing the cucurbituril derivative having the formula ~~(1)~~(1) with n=8 from the product mixtures obtained in step (b1), (b2) or (b3); (d1) diluting the remaining solution after step (c1) with water and acetone to produce a precipitate which is filtered and further treated in step (e1), and removing the solvent from the resulting filtrate to obtain the cucurbituril derivatives having the formula (1), with n ranging from 9 to 20; and (e1) partially dissolving the precipitate obtained in step (d1) in water to obtain the cucurbituril derivatives with n=5 and 7 from the water soluble fraction,

and the cucurbituril derivative with  $n=6$  from the water insoluble fraction. Separation of the cucurbituril derivative with  $n=5$  from the cucurbituril derivative with  $n=7$  in the water soluble fraction, which is obtained from step (e1), is achieved by partial precipitation using a mixed solvent of water and methanol.

Amendments to the paragraph beginning at page 6, line 11:

The present invention provides the cucurbituril derivatives having the formula (1)



where X is O, S or NH;  $R_1$  and  $R_2$  are independently selected from the group consisting of hydrogen, alkyl groups of 1 to 30 carbon atoms, alkenyl groups of  $\pm 2$  to 30 carbon atoms, alkynyl groups of  $\pm 2$  to 30 carbon atoms, alkylthio groups of 1 to 30 carbon atoms, alkylcarboxyl groups of  $\pm 2$  to 30 carbon atoms, hydroxyalkyl groups of 1 to 30 carbon atoms, alkylsilyl groups of 1 to 30 carbon atoms, alkoxy groups of 1 to 30 carbon atoms, haloalkyl groups of 1 to 30 carbon atoms, nitro group, alkylamine groups of 1 to 30 carbon atoms, amine group, aminoalkyl groups of 1 to 30 carbon atoms, unsubstituted cycloalkyl groups of 5 to 30 carbon atoms, cycloalkyl groups of 4 to 30 carbon atoms with hetero atoms, unsubstituted aryl groups of 6 to 30 carbon atoms, and aryl groups of 6 to 30 carbon atoms with hetero atoms; and  $n$  is an integer from 4 to 20, wherein the cucurbituril derivatives having the formula (1), where  $n=6$ ,  $R_1=H$ ,  $R_2=H$  and  $X=O$ , and  $n=5$ ,  $R_1=CH_3$ ,  $R_2=H$  and  $X=O$ , are excluded.

Amendments to the paragraph beginning at page 7, line 1:

The alkyl groups of 1 to 30 carbon atoms for  $R_1$  and  $R_2$  may include methyl, ethyl, propyl, isopropyl and t-butyl groups. The alkenyl groups of  $\pm 2$  to 30 carbon atoms for  $R_1$  and  $R_2$  may include propylene and butene groups, and the alkynyl groups of  $\pm 2$  to 30 carbon

atoms therefor may include a hexynyl group. The alkylthio groups of 1 to 30 carbon atoms may include butylmethylsulfide and octanethiol groups. The alkylcarboxyl groups of ~~1~~2 to 30 carbon atoms may include carboxypropyl and carboxylbutyl groups, and the hydroxyalkyl groups of 1 to 30 carbon atoms may include hydroxybutyl and hydroxyethyl groups. The alkylsilyl groups of 1 to 30 carbon atoms may include aryltriethylsilyl and vinyltriethylsilyl groups, and the alkoxy groups of 1 to 30 carbon atoms may include methoxy and ethoxy groups. The haloalkyl groups of 1 to 30 carbon atoms may include CF<sub>3</sub> and CH<sub>2</sub>Cl, and the aminoalkyl groups of 1 to 30 carbon atoms may include 2-aminobutyl and 1-aminobutyl groups. The unsubstituted cycloalkyl groups of 5 to 30 carbon atoms may include cyclohexyl and cyclopentyl groups, and the cycloalkyl groups of 4 to 30 carbon atoms with hetero atoms may include piperidyl and tetrahydrofuranyl groups. The unsubstituted aryl groups of 6 to 30 carbon atoms may include phenyl, benzyl and naphthyl groups, and the aryl groups of 6 to 30 carbon atoms with hetero atoms may include pentafluorophenyl and pyridyl groups.

Amendment to the paragraph beginning at page 9, line 7:

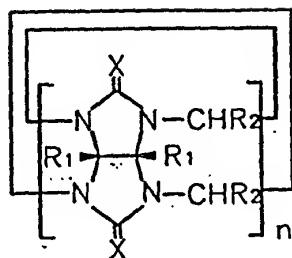
The reaction mixture is subjected to a further reaction at 95 to 105°C. The final reaction product varies depending on the reaction temperature and the amount of reactants. The usual final reaction product is a mixture of two or more cucurbituril derivatives having the formula (1) hereinabove, where  $n$  is a value from 5 to ~~20~~20.

Amendment to the paragraph beginning at page 9, line 15:

However, during the reaction at 95 to 105°C, the cucurbituril derivative with  $n=6$  may precipitate in ~~a~~a crystalline form, depending on the reaction temperature, moisture content in the air, and concentration of reactants.

Amendments to the paragraph beginning at page 9, line 20:

First, the final reaction mixture is diluted with water and left on bench at room temperature to give the cucurbituril derivative having the formula (1) hereinbelow, where  $n=8$ .



...(1)

where X is O, S or NH;  $R_1$  and  $R_2$  are independently selected from the group consisting of hydrogen, alkyl groups of 1 to 30 carbon atoms, alkenyl groups of  $\pm 2$  to 30 carbon atoms, alkynyl groups of  $\pm 2$  to 30 carbon atoms, alkylthio groups of 1 to 30 carbon atoms, alkylcarboxyl groups of  $\pm 2$  to 30 carbon atoms, hydroxyalkyl groups of 1 to 30 carbon atoms, alkylsilyl groups of 1 to 30 carbon atoms, alkoxy groups of 1 to 30 carbon atoms, haloalkyl groups of 1 to 30 carbon atoms, nitro group, alkylamine groups of 1 to 30 carbon atoms, amine group, aminoalkyl groups of 1 to 30 carbon atoms, unsubstituted cycloalkyl groups of  $\pm 5$  to 30 carbon atoms, cycloalkyl groups of 4 to 30 carbon atoms with hetero atoms, unsubstituted aryl groups of 6 to 30 carbon atoms, and aryl groups of 6 to 30 carbon atoms with hetero atoms; and  $n$  is an integer from 4 to 20.

Amendment to the paragraph beginning at page 15, line 28:

The reaction mixture was diluted with 200 mL of water, and 1.0 L of acetone was further added to form a precipitate. The precipitate was filtered and then stirred in a mixture of 200 mL of water and 800 mL of acetone for 5 minutes. The precipitate was filtered and dissolved in 200 mL of water. Then, the water insoluble fraction was filtered and 1.0 L of acetone was added to the filtrate to form a precipitate. The precipitate was filtered and dissolved in a mixture of 50 mL of water and 60 mL of methanol. The insoluble fraction was filtered and 500 mL of acetone was added to the filtrate to form a precipitate. The precipitate was filtered, washed with acetone, and dried for 24 hours to give a cucurbit[5]uril in a yield of 10%.

Amendment to the paragraph beginning at page 17, line 22:

The dried powder was dissolved in water, the water insoluble fraction of the solution was completely dissolved with an appropriate amount of H<sub>2</sub>SO<sub>4</sub>. 5% of THF by volume with respect to the total solution was carefully added to the solution and the acetone was vapor diffused into the solution at room temperature for 12 hours. Then, the reaction product was stored in a refrigerator set at 6°C for 12 hours to give colorless crystalline cucurbit[7]uril in a yield of 20%.